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1. Introduction

The present report describes the results of a gravity project conducted in March 3, 2010 by senior scientist Gabriel Strykowski, DTU Space and Mr. Bjarne Lorenzen. The task was to measure gravity on all floors of a 30 storey building, Domus Vista, Frederiksberg, Denmark. According to (web 1) the height of the Domus Vista is some 102 m.

Two Scintrex CG-5 relative gravimeters of DTU Space were used. The gravity survey was tied to the absolute gravity station Copenhagen University (Timmen et al., 2008). The reference gravity value is 981446.595 +/- 0.003 mGal. This value was held fixed (within the error bars) in the adjustment of the measured gravity data.

On January 20, 2010 Gabriel Strykowski did a pilot project in Domus Vista. The measurements were only done on selected floors (the ground level, 5^{th}, 10^{th}, 15^{th}, 20^{th}, 25^{th} and 29^{th}), i.e. roughly on each 5th floor. The location of the gravity stations of the pilot project and the present project for the same floor is not identical. In the pilot project the external balcony was used. In the present project the same spot on all floors on the inner staircase was used, see fig. 1.

2. The data collection and the data processing

Each CG5 measured 4 sets of 60 sec. Each set consisted of 55 measurements of 1 sec and a time delay of 5 sec to store the data. Thus, for each instrument, and for each station (one on each floor), 4 data were obtained each of which is an average of 55 individual measurements. In practice, to save time, the two instruments measured in parallel on two different floors. Station #2 at the ground floor was measured twice by each instrument. The tidal correction was not used. All set data were store into the internal memory of the CG5s.

Subsequently, the raw CG5 data were downloaded and transformed to the input format of DTU Space gravity network adjustment software. For each station, and for each of the two instruments, the gravity reading that goes into the adjustment is the time average of the 4 sets. The time is the mean time of the averaged measurements. The averaged gravity data were subsequently subjected to the standard processing using the implicit scale factor of 1.0 (for transforming from the counter units to mGals) for the two CG-5s. The steps are as follows:

- Reduction of the gravity data by the effect of tides and transformation from counter units to mGals.
- Adjustment of the gravity data by estimating a linear drift for each instrument and by assuming that the gravity value (already corrected for tides) is constant for each station.

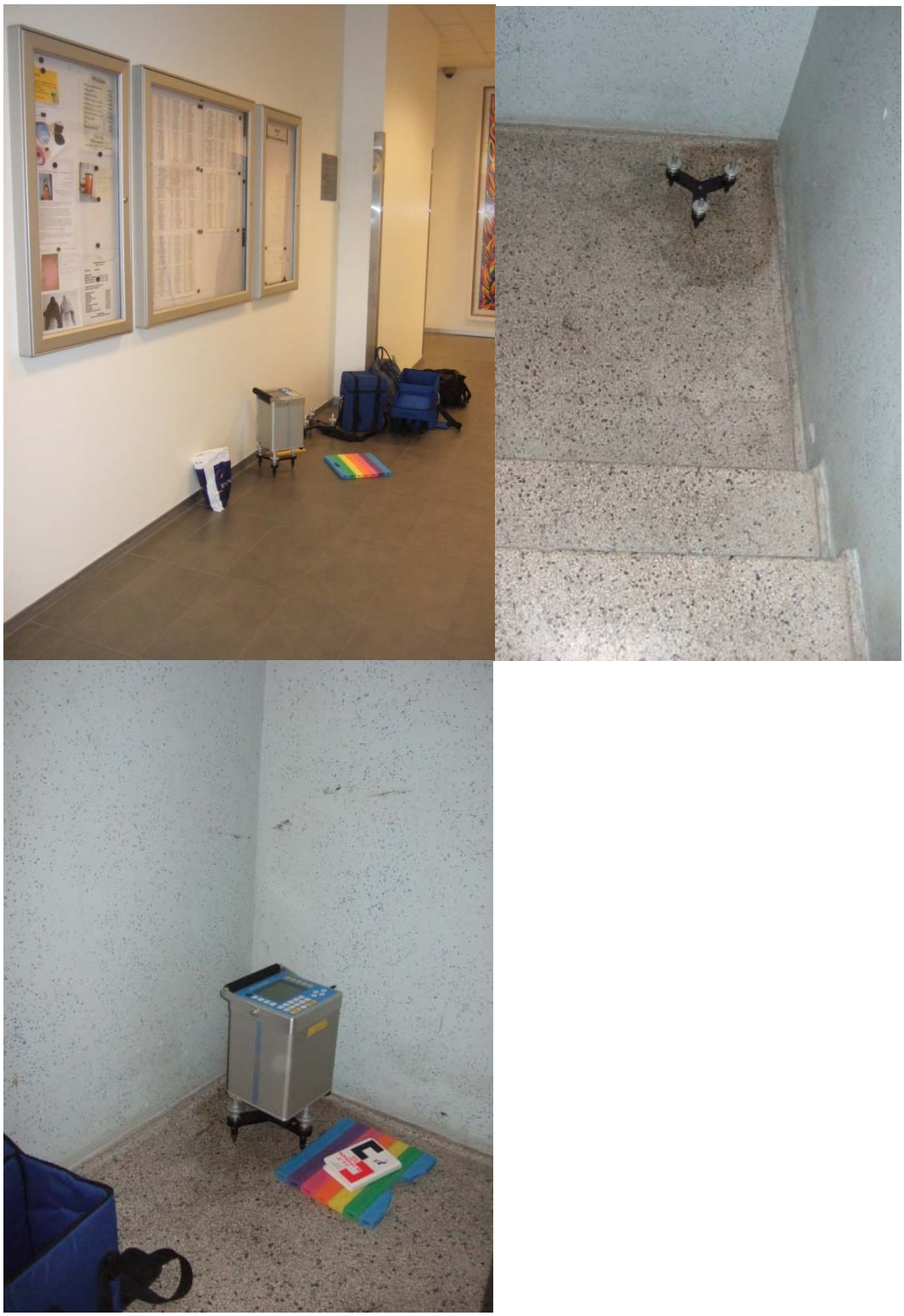

Fig. 1 Gravity stations in Domus Vista. **Top left:** station #2 at the ground floor (this station is common with the Pilot Project); **Top right and bottom left:** all gravity stations (except #2) of the Domus Vista Gravity Project were placed in the same spot on each floor in the corner of the fire escape stairway. The distance to the two walls is 0.30 m x 0.30 m.

3. The results

The results of the project can be seen in Table 1. For comparison, whenever possible, the results of the pilot project are also provided. One should notice that (except for station #2) the location of the gravity stations of the Pilot Project and the present project is not quite identical.

Station #	gravity (mGal)	std. dev. (mGal)	comparable gravity of PilotProject (mGal)	std. dev. PilotProject (mGal)	Station location
2	981547.684	0.007	981547.676	0.006	ground floor
3	981546.482	0.008			1ST floor
4	981545.367	0.008			2nd floor
5	981544.266	0.008			3rd floor
6	981543.421	0.008			4th floor
7	981542.588	0.008	981542.524	0.008	5th floor
8	981541.738	0.008			6th floor
9	981540.893	0.008			7th floor
10	981540.057	0.008			8th floor
11	981539.206	0.008			9th floor
12	981538.353	0.008	981538.303	0.008	10th floor
13	981537.511	0.008			11th floor
14	981536.655	0.008			12th floor
15	981535.807	0.008			13th floor
16	981534.952	0.008			14th floor
17	981534.100	0.008	981534.034	0.008	15th floor
18	981533.240	0.008			16th floor
19	981532.381	0.008			17th floor
20	981531.528	0.008			18th floor
21	981530.668	0.008			19th floor
22	981529.814	0.008	981529.765	0.008	20th floor
23	981528.960	0.008			21st floor
24	981528.096	0.008			22nd floor
25	981527.229	0.008			23rd floor
26	981526.375	0.008			24th floor
27	981525.522	0.008	981525.499	0.008	25th floor
28	981524.679	0.008			26th floor
29	981523.822	0.008			27th floor
30	981522.968	0.008			28th floor
31	981522.131	0.008	981522.102	0.008	29th floor
32	981521.273	0.008			30th floor

Table 1. The results of The Domus Vista Gravity Project (March 03, 2010) and the comparable gravity values of the Pilot Project (January 20, 2010). Except for station #2, the location of stations on the same floor for the two projects is not identical.

One additional conclusion of the project (not discussed here) is that the performance of both Scintrex gravimeters is extremely stable and consistent.

Conclusions

Gravity was measured on all floors of a 30 storey building Domus Vista in Frederiksberg, Denmark. The gravity value for each station is shown in Table 1. The two Scintrex CG-5 meters of DTU Space are very stable and show consistent results.

References

Timmen, L., Gitlein, O., Müller, J., Strykowski, G., Forsberg, R.: *Absolute gravimetry with the Hannover meters JILAg-3 and FG5-220, and their deployment in a Danish-German cooperation.* In Zeitschrift für Geodäsie, Geoinformation und Landmanagement, 3/2008, Jg. 133, 149-163, Wissner-Verlag, Augsburg, 2008.

web 1: Domus Vista. http://da.wikipedia.org/wiki/Domus_Vista